



Amphidonte (Amphidonte) pyrenaica (Leymerie, 1851) (Bivalvia, Ostreoidea) in the Maastrichtian of Sardinia

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ABSTRACT - *The finding of the oyster Amphidonte (A.) pyrenaica within a Lower Maastrichtian sandstone clast of the Lutetian Cuccuru 'e Flores Conglomerate in the territory of Oliena (eastern Sardinia) is recorded. This clast constitutes another example of Maastrichtian shallow water facies contrasting with the coeval in situ rocks of the nearby Lanaittu valley, represented by blackish hemipelagic marls with turbidites interbeds. This striking difference in lithology and facies between Maastrichtian clasts of the Cuccuru 'e Flores Conglomerate and nearby outcropping coeval formations suggests the existence in eastern Sardinia during Late Cretaceous times of a complex palaeogeography, possibly induced by significant synsedimentary tectonics.*

RIASSUNTO - [*Amphidonte (A.) pyrenaica* (Leymerie, 1851) (Bivalvia, Ostreoidea) nel Maastrichtiano della Sardegna] - *Si segnala il ritrovamento di Amphidonte (Amphidonte) pyrenaica in un clasto di arenaria maastrichtiana del Conglomerato di Cuccuru 'e Flores, di età luteziana, nel territorio di Oliena (Sardegna orientale). Questo clasto costituisce quindi un altro testimone, oltre a quelli segnalati in precedenza, di facies maastrichtiane di acque basse contrastanti nettamente con i termini coevi affioranti nelle zone circostanti, rappresentati da marne emipelagiche nerastre con intercalazioni torbiditiche. Questa rilevante differenza di facies tra i clasti maastrichtiani del Conglomerato di Cuccuru 'e Flores e le rocce coeve in situ della stessa area induce quindi a ritenere che nel Cretaceo terminale esistesse nella Sardegna orientale una paleogeografia piuttosto articolata, possibilmente condizionata da una significativa tettonica sinsedimentaria.*

GEOLOGIC AND STRATIGRAPHIC INTRODUCTION

The Jurassic to Lower Eocene sedimentary cover of eastern Sardinia, for the most part consisting of carbonate rocks, is in places unconformably overlain by polymictic conglomerates and breccias. This clastic formation, known as Cuccuru 'e Flores Conglomerate in the regional geological literature and cropping out in the Mt. Albo massif, Orosei, and "Oliena Supramonte", is mostly developed as thin wedges lining some important transpressive faults with great vertical offset and locally unconformably overlying a folded and eroded substratum. The lithostratigraphic unit is undoubtedly the sedimentary expression of severe tectonic movements and is itself involved in later deformations (Dieni & Massari, 1966; Dieni et al., 2008). The syntectonic rudist deposits mostly contain clasts of the local stratigraphic succession, from the Palaeozoic crystalline basement to middle Cuisian nummulitic limestones. In addition, they include elements of facies unknown in outcrop, such as Campanian and Maastrichtian rudist limestones (Busulini et al., 1984), Danian, Selandian, Thanetian, and Ilerdian limestones (Dieni et al., 1979; Dieni & Massari, 1985; Dieni et al., 2008). Only recently the study of the palynological content of mudstone interbeds of the polymictic rudites allowed to Dieni et al. (2008) the assignment of the Cuccuru 'e Flores Conglomerate to the middle Lutetian.

As above noted, clasts of lithologies and ages unknown in the areas surrounding the Cuccuru 'e Flores

Conglomerate outcrops occur. They are extremely useful in reconstructing the original stratigraphic succession and palaeogeography of eastern Sardinia, especially in Late Cretaceous and early Palaeogene times, as formations of this age are now completely lacking in this part of the island. A rich clast collection therefore was particularly focused on the Upper Cretaceous and lower Palaeogene lithologies at present missing in outcrop. For this purpose more than three hundred clasts of these terms (defined as "witness clasts" by Dieni et al., 2008) were biostratigraphically studied and the results obtained in the various localities from the Mt. Albo massif (northernmost outcrops) to the "Oliena Supramonte" (southernmost outcrops), were reported by Dieni et al. (2008). Striking differences in lithology and facies between clasts and nearby outcropping coeval formations evidence a complex palaeogeography and may imply significant synsedimentary tectonics. For instance, at Sòvana, in the "Oliena Supramonte", the Cuccuru 'e Flores Conglomerate contains clasts of Campanian and Maastrichtian shallow water rudist limestones contrasting with the locally existing coeval facies of the nearby Lanaittu valley, where the Campanian-Maastrichtian interval (outcrops and borehole "Lanaittu 1", research in progress) is characterised by blackish hemipelagic marls with turbidite interbeds in the upper part (Busulini et al., 1984). And just from Sòvana (where Maastrichtian clasts are particularly abundant in the rudites) comes the specimen of ostreid bivalve object of this note. It was derived from a clast of sandstone the age of which is

regarded as early Maastrichtian because of the rich content of larger foraminifera [*Orbitoides media* (d'Archiac), *Siderolites calcitrapoides* Lamarck, etc.] very similar to that characterising another clast of shallow-water facies from the same locality, containing the decapod *Protocallianassa* cf. *faujasi* (Desmarest) and an assemblage of smaller and larger foraminifera very significant from the biostratigraphic point of view (Dieni, in press).

SYSTEMATIC DESCRIPTION

The higher classification adopted is that proposed by Stenzel (1971) with some adjustments by Malchus (1990).

The specimen is deposited in the Museum of Geology and Palaeontology, University of Padova (MGPD).

Class BIVALVIA Linnaeus, 1758
Subclass PTERIOMORPHIA Beurlen, 1944
Order PTERIOIDA Newell, 1965
Suborder OSTREINA Férussac, 1822
Superfamily OSTREOIDEA Rafinesque, 1815
Family GRYPHEIDAE Vialov, 1936
Subfamily EXOGRINAE Vialov, 1936

Genus *Amphidonte* Fischer de Waldheim, 1829

Amphidonte (*Amphidonte*) *pyrenaica* (Leymerie, 1851)

Fig. 1

- 1851 *Exogyra pyrenaica* - LEYMERIE, p. 194, pl.10, figs. 4-6.
1869 *Ostrea auricularis* Geinitz - COQUAND, p. 28, pl.8, figs. 1-12 (as *Ostrea cornu-arietis* Coquand).
1990 *A. (Amphidonte) pyrenaicum* (Leymerie) - MALCHUS, p. 115 (cum syn.).
1990 *A. (Amphidonte) pyrenaicum* "forma nofretete" MALCHUS, p. 116, pl.5, figs. 11-15; pl. 6, figs. 1-5 (cum syn.).
2002 *Amphidonte pyrenaicum* (Leymerie)-KASSAB & ZAKHERA, p.5, fig. 3 (1-3).
2002 *Amphidonte radiatum* n. sp. - KASSAB & ZAKHERA, p.5, fig. 3 (4-6).

Material - One somewhat decorticated left valve from a sandstone clast of the Lutetian Cuccuru 'e Flores Conglomerate; MGDP 30810.

Finding locality - Sòvana, about 5 km ESE of the Oliena village (Nuoro). Coordinates: 40° 15' 18" N, 9° 27' 50" E.

Dimensions - H = about 51 mm; B' (*sensu* Dhondt & Dieni, 1988) = about 17 mm; L = not valuable.

Remarks - Chomata ("Reliktchomata" and "Stegchomata" after Malchus, 1990, pp. 84 and 110) are visible (actually as casts) near the umbo and the lower margin, as are typical for the genus *Amphidonte* s.s.

The specimen from the Lower Maastrichtian at Sòvana belongs undoubtedly to *A. pyrenaica* even if it seems wider than the lectotype (Leymerie, 1851, pl.10, figs. 5a, b; designated by Malchus, 1990, p.115, as "Holotypus"; application of I.C.Z.N., 2000, article 74.5). The interpretation of Coquand (1869) of "*Ostrea auricularis* Geinitz", in which he includes *Exogyra pyrenaica*, is dubious. The specimens from Maastricht which Coquand (op. cit., p. 29) includes in his synonymy do not belong to the taxon from south-western France described by him and of which he undoubtedly had specimens. Very probably they are referable to *Amphidonte auricularis* (Wahlenberg, 1821).

The specimens both of Leymerie and Coquand (op. cit.) belong to the genus *Amphidonte* s.s. as described and illustrated by Malchus (1990, p. 114).

A. pyrenaica is a highly variable species. More than thirty specimens of this taxon were collected at Larcen (Haute-Garonne) in upper Maastrichtian strata, where it occurred with *Neithea truellei* (d'Orbigny, 1847), *Pycnodonte vesicularis* (Lamarck, 1806), *Agerostrea* sp., etc. The rich sample has demonstrated that *A. pyrenaica* has a wide variability spectrum. From narrow valves as illustrated by Leymerie (1851) to wide specimens with H and L almost equal all transition are observable; the narrow specimens are on average more convex than the wide specimens. The variability of the sample from Larcen (the specimens are also very thick-shelled, probably indicating an environment of shallow warm seas) illustrates that *Amphidonte* (*A.*) *pyrenaicum* "forma nofretete" Malchus, 1990, from the Maastrichtian of Egypt, does indeed fall within the variability of the

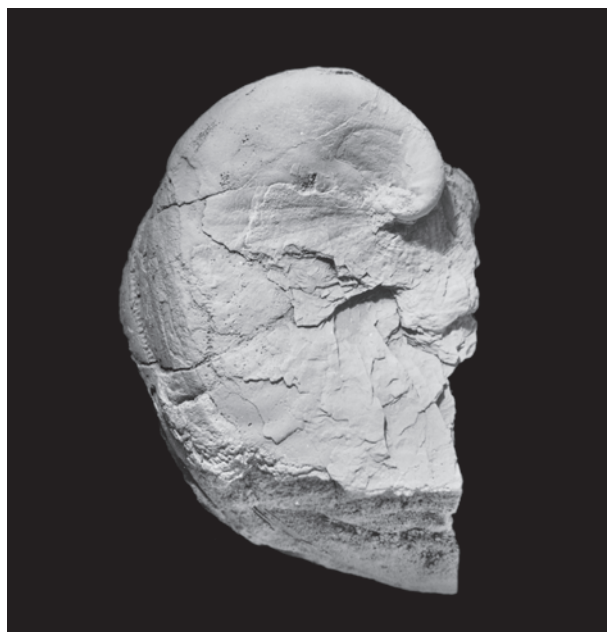


Fig.1 - *Amphidonte* (*A.*) *pyrenaica* (Leymerie, 1851); left valve, whitened, 1.5x. Chomata are visible, as casts, near the umbo and the lower margin. Early Maastrichtian sandstone clast of the Lutetian Cuccuru 'e Flores Conglomerate at Sòvana (Oliena).

species. Already Malchus himself (1990, p. 118) suggested this as a possibility.

In our opinion also *Amphidonte radiatum* Kassab & Zakhera, 2002, again from the Egyptian Maastrichtian, has no sufficient characters to be distinguished from *A. pyrenaica*.

Range and occurrence - *A. (A.) pyrenaica* has a typical Tethyan distribution. It is recorded from the upper Campanian-upper Maastrichtian of SW France and Tadjikistan and from Maastrichtian of Spain, Libya, Egypt, Madagascar, Baluchistan and India.

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